



U.S. DEPARTMENT OF **ENERGY**

Savannah River Operations Office Briefing to The Nuclear Cleanup Caucus

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EM ***Environmental Management***

safety ♦ performance ♦ cleanup ♦ closure

www.em.doe.gov

Savannah River Site: A History of National Service

- Since the early 1950s, the Savannah River Site (SRS) has provided knowledge, technology and integrated solutions for our most pressing national needs
- SRS pioneered the development of nuclear technologies and deployed those technologies at scales never before imagined
- SRS accomplishments continue to stand at the core of our nation's nuclear deterrent



SRS at a Glance

- Established in 1950 to support national defense missions
- Produced tritium (only U.S. source) and weapons-grade plutonium
- Over 38,000 workers at peak (Current workforce is ~11,000)
- SRS covers 198,000 acres (310 square miles)



Historic Photos (from left)

- R Reactor in 1951
- H Canyon in 1952

SRS: A Multi-Program Site with Missions Vital to the Nation

SRS continues its heritage of service to the nation through environmental stewardship, nonproliferation, and national security.

- **Environmental Stewardship**

- Safe, effective cleanup of Cold War legacy nuclear materials
- Construction, operations and closure of facilities to store, treat and dispose of tank waste
- Groundwater cleanup

- **Nonproliferation**

- Construction of Mixed Oxide (MOX) Fuel Fabrication Facility and Waste Solidification Building

- **National Security**

- Nation's only supplier of tritium for the nuclear stockpile



Photos (clockwise):

- 235-F Stack Reduction
- Tritium Reservoir
- L-Basin

SRS: A Skilled Workforce is Our Greatest Resource

DOE: Savannah River Operations Office

NNSA: Savannah River Site Office

Office of Site Engineering and
Construction Management

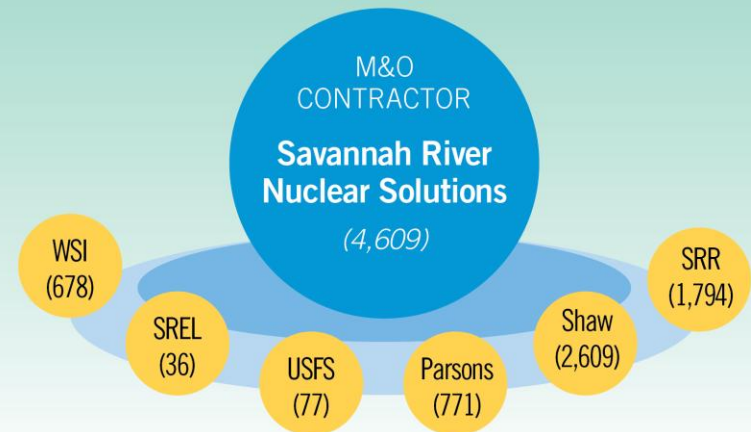
U.S. Forest Service

U.S. Nuclear Regulatory Commission

U.S. Army Corps of Engineers

Department of Energy-Environmental Management (311)

National Nuclear Security Administration (73)



WSI Team, Savannah River Ecology Laboratory, U.S. Forest Service, Parsons, Shaw Areva MOX Services, Savannah River Remediation
Permanent Employees

Contractors:

- **Savannah River Nuclear Solutions:** Site Management & Operations and Savannah River National Laboratory (EM National Laboratory)
- **Savannah River Remediation:** Liquid Waste Operations
- **Parsons:** Salt Waste Processing Facility (construction and operations)
- **Ameresco:** Biomass Cogeneration Plant
- **Wackenhut:** Security
- **Shaw AREVA:** MOX Fuel Fabrication Facility (construction and operations)
- **University of Georgia:** Savannah River Ecology Laboratory

SRS: EM Budget Request

DOE Office of Environmental Management (EM) Budget at SRS	FY 2012 Enacted	FY 2013 President's Request
SRS Risk Management Operations		
Nuclear Material Storage and Disposition	233,008	273,594
Spent Nuclear Fuel Storage and Disposition	39,771	44,101
Solid Waste Management	29,163	67,421
Soil and Groundwater Remediation	37,704	58,973
Tank Waste Storage and Disposition	664,981	698,294
Salt Waste Processing Facility	170,071	22,549
Glass Waste Storage Building #3	3,500	0
Safeguards and Security	129,140	121,977
Community and Regulatory Support	9,584	16,584
Total	1,316,922	1,303,493

Fiscal Year 2012 Accomplishments

- Began new missions for H Canyon (modified ops)
- Commenced closing tanks 18 and 19 by addition of stabilizing grout
- Began disposition to Waste Isolation Pilot Plant (WIPP) of certain surplus plutonium not suitable for feed to the MOX facility
- Began evaluating more cost-effective storage methods for Defense Waste Processing Facility (DWPF) immobilized waste canisters

Revitalized Safety Focus Among SRS Workforce

Safety Begins With **US**: Forefront of All We Do at SRS

“See Something Say Something” Campaign

- Safety First Focus and Questioning Attitude = Healthy Safety Program
Intent on Continuous Improvement

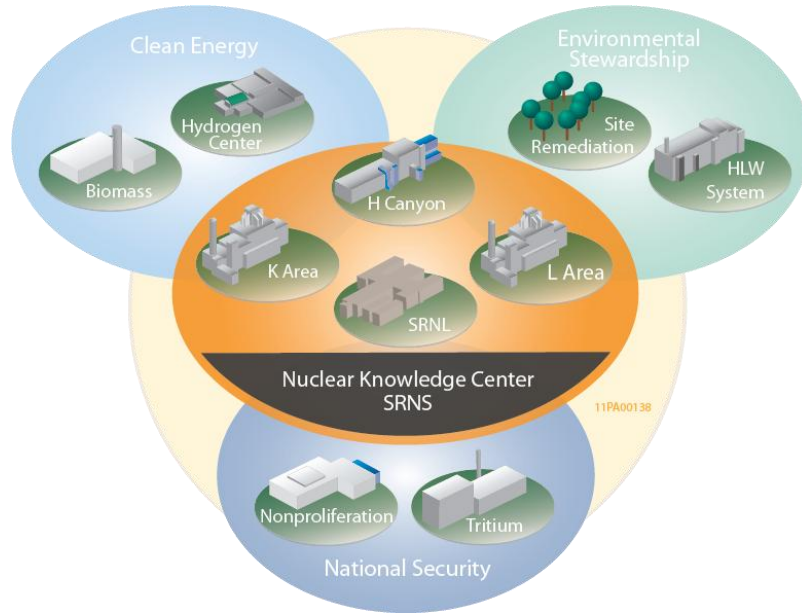
**This is James.
He works at SRS.**

**James has the power
to say something for safety.
Just like you.**



See Something Unsafe? Say Something for Safety!

Savannah River National Laboratory (SRNL)

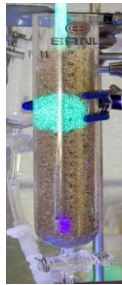


- Multi-Program National Laboratory
- Staff: ~1,000
- Budget: ~ \$260M (FY11)
- Three focused missions: Environmental Stewardship, Clean Energy, National Security
- Core nuclear capabilities: chemical processing/separation; materials; tritium/hydrogen; and environmental science

Environmental Stewardship

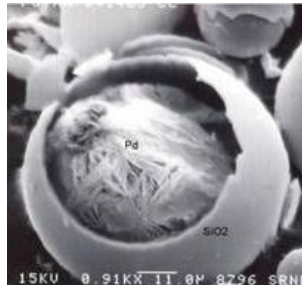


Solvent extraction technology for salt waste processing



Cleanup technology

Clean Energy



Porous wall hollow glass microspheres



Off-shore wind research

National Security



FBI forensics

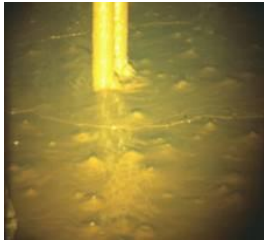


Tracking/locating technology

Liquid Waste (LW) Operations



Salt Supernate



Sludge



Safely Stored

The LW contractor is Savannah River Remediation LLC (SRR)

Contract Focus:

- Safely managing 37 million gallons of radioactive liquid tank waste to be treated and stabilized for final disposition
- Emptying, cleaning, and closing radioactive waste tanks
- Operating major nuclear facilities to treat and dispose of waste, e.g., DWPF and Saltstone Production and Disposal Facility
- During 2011:
 - Produced a record 266 canisters of vitrified high-level waste
 - Treated 1.2 million gallons with interim salt waste processing system
 - Disposed of 3.9 million gallons of low-level waste grout

Liquid Waste Facilities



Saltstone Production/Disposal Facility

- Lower activity, treated liquid waste from underground tanks is solidified and disposed of at Saltstone at SRS
- The waste is disposed of at Saltstone:
 - *Safely stabilizes low-activity radioactive liquid salt wastes*
 - *Salt solution stabilized by mixing it with cement, fly ash, and slag*
 - *Resulting grout mixture is mechanically pumped into concrete disposal units, called the Saltstone Disposal Facility*
 - *Grout solidifies into non-hazardous low-radioactivity waste form called "saltstone"*



Defense Waste Processing Facility (DWPF)

- Little waste volume goes here, but almost all curies are dispositioned at DWPF
- World's largest vitrification plant
- Over 3,300 canisters filled
- DWPF has poured more than 11.7 million gallons of glassified waste
- Entire 37 million gallons of waste in the tanks awaiting disposition has about 320 million curies of radioactivity



Interim Storage of Canisters

- DWPF Glass Waste Storage Buildings (GWSB)
 - *GWSB 1 contains 2,244 canisters*
 - *GWSB 2 currently contains ~1,100 canisters (capacity for 2,340)*
- Underground reinforced concrete vaults
- Seismically qualified
- Designed for safe interim storage

Salt Waste Processing Facility



Salt Waste Processing Facility – Being constructed by Parsons

- Total Project Cost: \$1.339 B
- Late Finish Date: October 2015
- Physical Percent Complete: 55%
- This facility will:
 - Reduce radioactive waste volume requiring vitrification
 - Separate low volume/high activity waste from high volume/low activity waste
 - Transfer high activity waste to the DWPF
 - Transfer low activity waste to the Saltstone Facility
 - Process 90% of Tank Farm liquid radioactive waste (97 M gallons after dissolution)
 - Designed to be capable of processing 6 million gallons of salt solution per year
 - Technology currently operational at smaller-scale facility at SRS

Nuclear Materials



K Area Complex



L Area Receiving
Basin

Making the World Safer Through Nuclear Nonproliferation Efforts

- K Area Complex
 - Receipt, storage, and surveillance of Special Nuclear Materials
- L Area Complex
 - Continue receipt of domestic and foreign Used Nuclear Fuel

Defense Programs



Tritium Extraction Facility



Reservoir



Tritium Facilities

- Recovering Tritium to Maintain National Defense
 - SRS has delivered high-quality tritium reservoirs for over 53 years with no missed shipments
- Tritium Responsive Infrastructure Modifications (TRIM) Initiative
 - Strategy to drive efficiency and revitalize the Tritium facilities for ongoing missions
- Helium-3 (He-3) Production
 - Provide a long term sustainable He-3 supply for the U.S. government

H Canyon and HB Line



H Canyon

- Only shielded nuclear chemical separations plant in operation in the U.S.
- Provided down-blended enriched uranium and low enriched uranium to the Tennessee Valley Authority for use in power reactors to generate electricity
- Process 3.5 metric tons of plutonium metal from K Area Material Storage into initial feed for MOX Fuel Fabrication Facility

Nuclear Nonproliferation

The Mixed Oxide (MOX) Fuel Fabrication Facility will convert at least 34 metric tons of weapons grade plutonium into mixed oxide fuel for use in commercial nuclear power plants. The Waste Solidification Building will handle waste generated by MOX.



MOX Fuel Fabrication Facility

Began Construction: August 2007

Total project complete: 59%

Construction/fab complete: 44%

Scheduled for completion: 2016

Current employment: 2,200

NRC and OSHA regulated



Waste Solidification Building

Began Construction: December 2008

Total project complete: 75%

Facility construction complete: 73%

Scheduled for completion: 2012

Startup: 2013

Current employment: 240

Pit Disassembly and Conversion

- A capability to disassemble nuclear weapons pits and convert the resulting surplus weapons grade plutonium metal into plutonium oxide suitable for use in the fabrication of mixed oxide fuel is under design
- Several alternatives are being evaluated to meet mission requirements

Savannah River Operations Office Cleanup Progress

Savannah River Nuclear Solutions

April 18, 2012

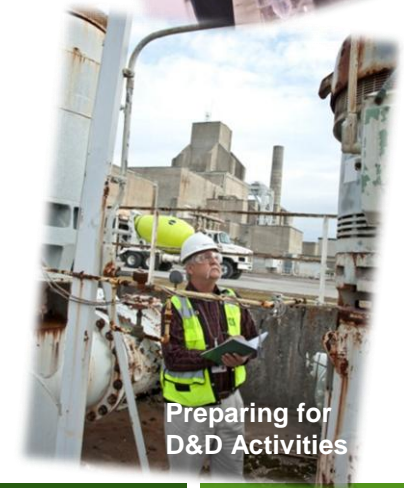
Presented by
Dwayne Wilson
SRNS President & CEO

Savannah River Nuclear Solutions (SRNS)

SRNS is the Management and Operating contractor for DOE's Savannah River Site in Aiken, SC

The primary initiatives for SRNS are national security, clean energy, and environmental stewardship

- Provide nuclear materials management to support national defense and U.S. nuclear nonproliferation efforts
- Support the National Nuclear Security Administration (NNSA) by extracting tritium and delivering products to military and weapons design agencies
- Develop and deploy environmental cleanup technologies
- Conduct technology Research and Development on national initiatives that facilitate energy independence



Safety Performance

Achieving World Class Safety Performance is Our Goal

- **SRNS operations and service subcontractor Total Recordable Case rate continues near lowest in 25 years**
 - 2011 Occupational Excellence Achievement Award from the National Safety Council
 - DOE-Voluntary Protection Programs Star of Excellence and DOE-VPP Contractor Champions Awards
- **Savannah River National Laboratory (SRNL)**
 - Surpassed 10 million safe hours without a lost workday
 - Recognized with the National Safety Council Industry Leader Award, Safety Leadership Award, and Occupational Excellence Achievement Award



Safety begins with me.



Accomplishments and Goals

Fiscal Year 2012 Accomplishments

- On schedule to complete all objectives of challenging \$1.4 billion American Reinvestment and Recovery Act (ARRA) Portfolio (> 90% complete to date)
- Initiated new HB Line campaign to prepare non-MOXable plutonium for Waste Isolation Pilot Plant disposal
- Received additional NNSA funding for H Canyon/HB Line and initiated preparations to produce 3.5 metric tons of plutonium oxide for initial MOX feed stock

Fiscal Year 2013 Goals

- Obtain world class safety performance
- Commence H Canyon/HB Line production campaign for initial MOX feed stock
- Continue ARRA projects including superstretch objective of 85% footprint reduction



American Reinvestment and Recovery Act (ARRA) Portfolio

- Completed greater than 90% of \$1.4 billion scope, on schedule, to complete baseline and additional stretch objectives
- Completed five capital projects ahead of schedule and under budget including first-of-a-kind in situ decommissioning of three reactors
- Achieved 74% footprint reduction (229 square miles), on schedule for stretch objective of 85% footprint reduction
- Removed 169,000 curies from South Carolina since April 2009
- Safely repackaged over 2,725 of 5,200 cubic meters of remaining legacy transuranic waste inventory to date
- On schedule to complete preparation of remaining legacy transuranic waste for final disposal in WIPP



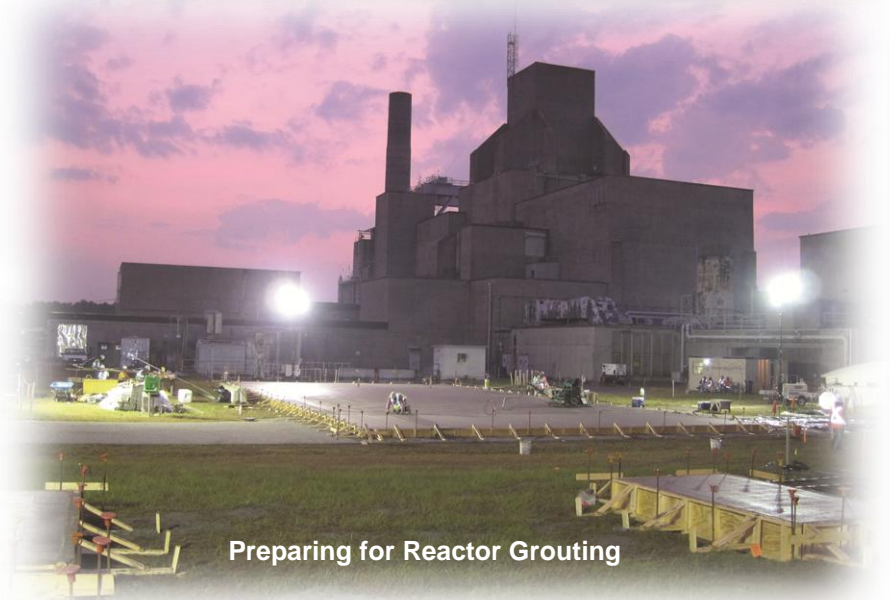
ARRA Accomplishments

Please click on the link below for video

<http://www.youtube.com/watch?v=cPBbn0Yewtw>

Remaining ARRA Work

- 900 cubic meters of TRU waste remains to be remediated towards 5,000 cubic meter goal
 - 1,375 cubic meters in certification process
 - 2,725 cubic meters disposed or ready for shipment
- On-site disposal of 49 legacy production reactor heat exchangers under way
- Installed and started evaporator operation in C Area to remove 3.4 million gallons of disassembly basin water; basin will be grouted
- Lower Three Runs watershed remediation – removal of cesium-contaminated soil, fencing, and posting area for long term surveillance



Savannah River National Laboratory

- **World Class Research**

- 2011 R&D 100 Award
 - Porous Walled Hollow Glass Microspheres
- New Product of the Year
 - Vadose Organic Substrate, a green technology to help break down soil contaminants

- **Core Nuclear Capabilities**

- Chemical Processing/Separation
- Materials
- Tritium/Hydrogen
- Environmental Science

- **Research and Engineering support for all facets of legacy waste cleanup**
- **Create and deploy innovative cleanup technologies**



Award Winning Expertise

Workforce Transition

SRNS Implemented a Workforce Restructuring, Impacting 1,065 Employees

December 2010	February 2011	June 2011	August 2011
Voluntary Separation 327	Involuntary Separation 342	Voluntary Separation 184	Involuntary Separation 212

- Displaced employees received severance and separation benefits
- Workforce Transition Center staffed with SRNS Workforce Services personnel has helped place more than 254 involuntarily displaced SRNS workers in new jobs
- Won “2011 Innovation Award” from the National Association of Development Organizations Research Foundation

SRNS Delivers Results

Nuclear Materials Management

- **New missions for H Canyon/HB Line**
 - Only facility of its kind in the nation
- **Expanded storage capacity in K Area**
 - CAT I facility handling excess plutonium
- **Used fuel receipts in L Area**

ARRA Portfolio

- **Currently > 90% complete**
 - \$1.4 billion scope of work
- **Disposed of > 50% of remaining 5,000 cubic meters of legacy transuranic waste**
- **Reduced footprint by 74%**
 - 229 of 310 square miles





**Savannah River
Remediation**

A URS COMPANY TEAMED
WITH BECHTEL | CH2M HILL | B&W | AREVA

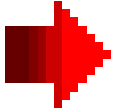
Savannah River Operations Office Cleanup Progress Savannah River Remediation

April 18, 2012

Presented by
L. David Olson
President and Project Manager

Liquid Waste Operations Overview

SRR Parent
Companies



URS



CH2MHILL



SRR Significant
Subcontractors



AREVA

ENERGYSOLUTIONS

URS
Safety Management
Solutions

- **Single Liquid Waste Operations contractor**
 - Savannah River Remediation LLC
 - Began work in July 2009
 - 6-year contract, 2-year option
 - Workforce of ~ 2,400 employees
 - Focused on acceleration of liquid waste mission
- **Liquid Waste Funding**
 - FY12 budget: ~ \$638M
 - Life cycle cost: ~ \$11.2B (FY08 to FY26)



Acceleration is possible by the partnership established between DOE-SR and SRR Leaders with support from SRNL



**Savannah River
Remediation**

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Safety Management

Industrial Safety



Radiological Safety



Environmental Safety



Chemical Safety



Safety: Awards/Perspective

- National Safety Council – Million Hour Award, and Occupational Excellence Achievement Award (Construction)
- S.C. Chamber of Commerce Annual Commendation of Excellence Award, and Commendation of Excellence Award (Construction), both 2011
- 2011: Productive record year for industrial and nuclear safety
- Completed over 10,500 field assessments and peer-to-peer observations

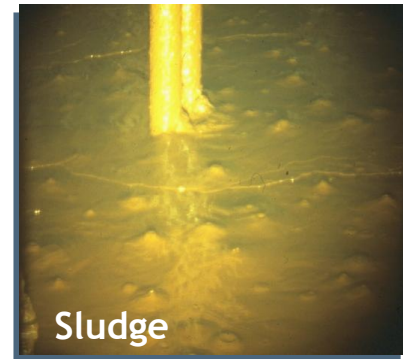
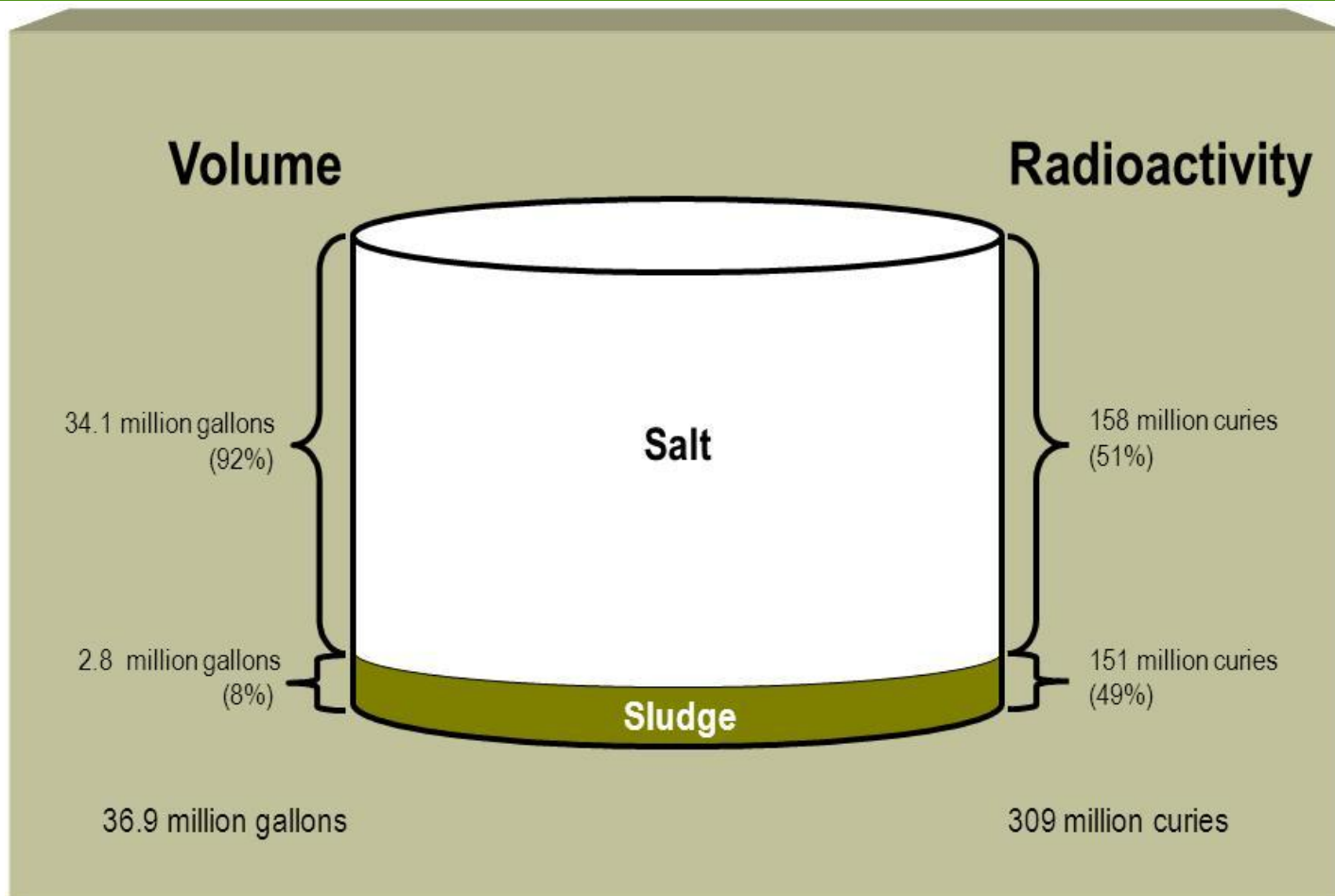


**Savannah River
Remediation**

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The Challenge: Waste in the Tanks



“The high-level waste at the Savannah River Site represents the single largest environmental risk in South Carolina” – South Carolina Department of Health and Environmental Control



**Savannah River
Remediation**

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The Solution for Waste in the Tanks

Legend

ARP – Actinide Removal Process

DWPF – Defense Waste Processing Facility

MCU – Modular Caustic Side Solvent Extraction Unit

SWPF – Salt Waste Processing Facility

Solid Lines – Current waste processing

Dotted Lines – Future/potential waste processing

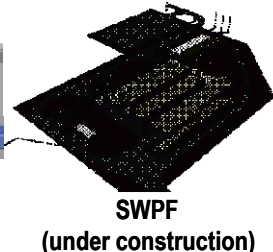
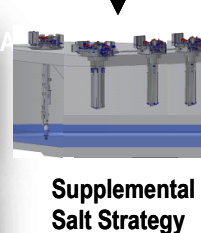
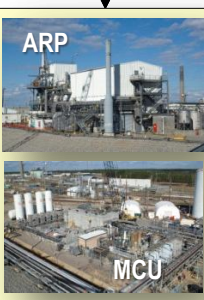
- ✓ Radionuclides to glass
- ✓ Chemicals to Saltstone
- ✓ Tanks empty and closed

Nuclear Materials Disposition



Salt waste

Interim Salt Processing



Sludge waste

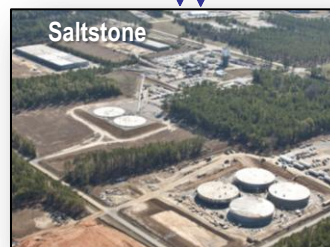


Radionuclides



>99% radionuclides to glass

Inert chemicals



<1% radionuclides to saltstone

Tanks Empty and Closed

Key Cleanup Accomplishments

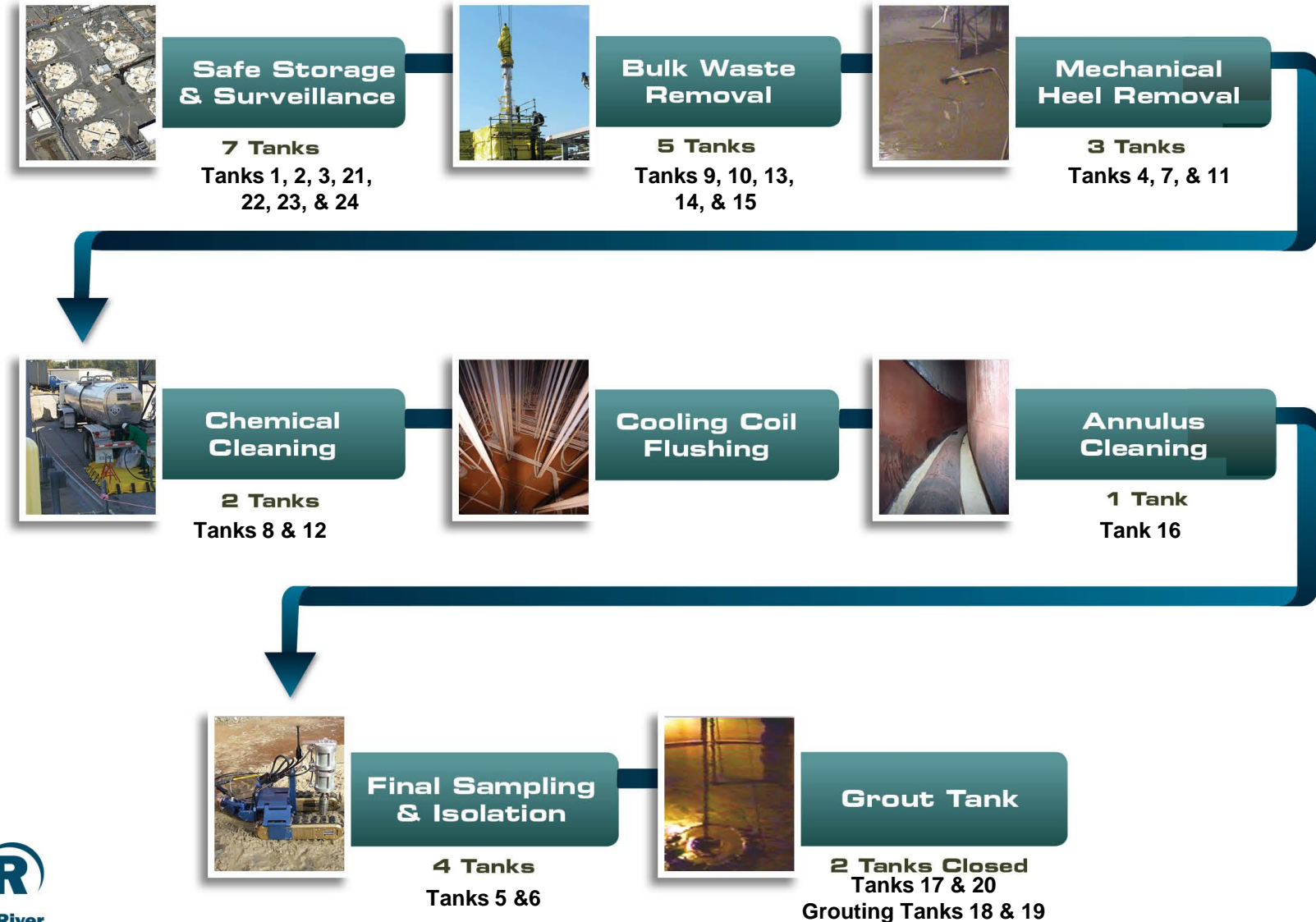
 WASTE TANKS	 SLUDGE	 DEFENSE WASTE PROCESSING FACILITY	 CANISTER OF VITRIFIED WASTE
Clean Up Scope		Accomplishments To Date	
 SALT		DWPF Canisters Produced	>3,300 of 7,557 Canisters Produced
		Salt Solution Processed	>4.6 Million Gallons of 110 Million Gallons
		Old-Style Radioactive Liquid Waste (RLW) Tanks Bulk Waste Removal Effort Complete	12 of 24 Old-Style RLW Tanks Bulk Waste Removal Effort Complete
		Old-Style RLW Tanks Closed	2 of 24 Old-Style RLW Tanks Closed
 INTERIM SALT TREATMENT	 SALTSTONE PRODUCTION FACILITY	 SALTSTONE DISPOSAL UNITS	



**Savannah River
Remediation**

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Tank Closure Progression



**Savannah River
Remediation**

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FY12 Accomplishments

- Defense Waste Processing Facility (DWPF) treated high level waste into glass at a record monthly production rate
- Modular Caustic Side Solvent Extraction Unit (MCU) treated salt waste at a record monthly production rate
- Saltstone disposed of decontaminated salt solution at a record monthly production rate
- Saltstone Disposal Unit (SDU) #2 construction was completed and operational readiness initiated
- Tanks 18 and 19 are now being stabilized with grout, the first at SRS since the first tanks were grouted in 1997

Please click on the link below for video

<http://www.youtube.com/watch?v=9IAZeYRBels>

FY13 Goals

- Operate production plants to treat waste:
 - Defense Waste Processing Facility (DWPF) will convert sludge into 275 canisters of glass
 - Modular Caustic Side Solvent Extraction Unit (MCU) will decontaminate 1.1 million gallons of salt waste
 - Saltstone will dispose of 1.5 million gallons of decontaminated salt solution
- Saltstone Disposal Unit (SDU) #3 and #5 construction complete and SDU #6 under an enhanced design is initiated
- Tanks 18 and 19 operationally closed and tanks 5 and 6 physically isolated for operational closure



Work outside a waste tank



Robots help remove waste from tanks



Workers monitor processes



Work inside DWPF

Summary

- **Our primary focus is on safe work**
 - Protect workers, public, environment
- **SRS embraces common goals and values with our external community that emphasize risk reduction**
- **SRS is committed to deploying transformational technologies that will accelerate liquid waste mission completion**
 - Focus on accelerating salt processing with application of transformational technologies
 - Continue to reduce risk with tank waste removal and meeting Federal Facility Agreement commitments
- **Continue to be good stewards of taxpayers' money**
 - Accelerating the cleanup saves money long-term
 - Technology is transferred to other sites, bringing more cost-savings

Savannah River Operations Office Cleanup Progress

Parsons

April 18, 2012

Presented by
Roy Schepens
Vice President

Salt Waste Processing Facility

Parsons is the contractor for the Salt Waste Processing Facility (SWPF) project

- Design, procure, construct, & operate for one year
- Process approximately 33 million gallons of radioactive salt waste supporting DOE's highest SRS priority to close tank farms, reduce risk, and complete the DOE EM cleanup mission

Safety

- Site is heavy construction with standard construction safety issues
- Transitioning from steel and concrete hazards to equipment installation and electrical hazards
- No radiological or bulk hazardous chemicals onsite
- Extensive onsite safety staff, providing 24-hour a day monitoring and assistance when craft are onsite
- Consistent re-enforcement of expected Safety Conscious Work Environment
- Periodic surveys to gauge trends of worker understanding & commitment
- Rigorous review of near misses to reduce likelihood of severe events

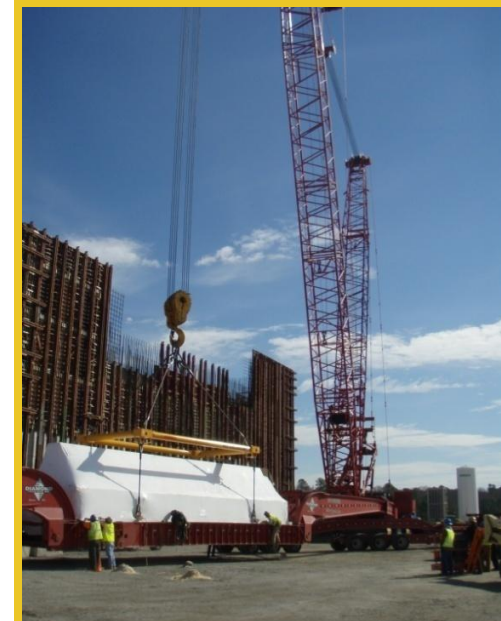
SWPF Construction Site

(SRS J-Area)



Cesium Removal Contactors

Arrival & Installation at SWPF



SWPF Nuclear Quality Assurance (NQA)-1 Tank Fabrication



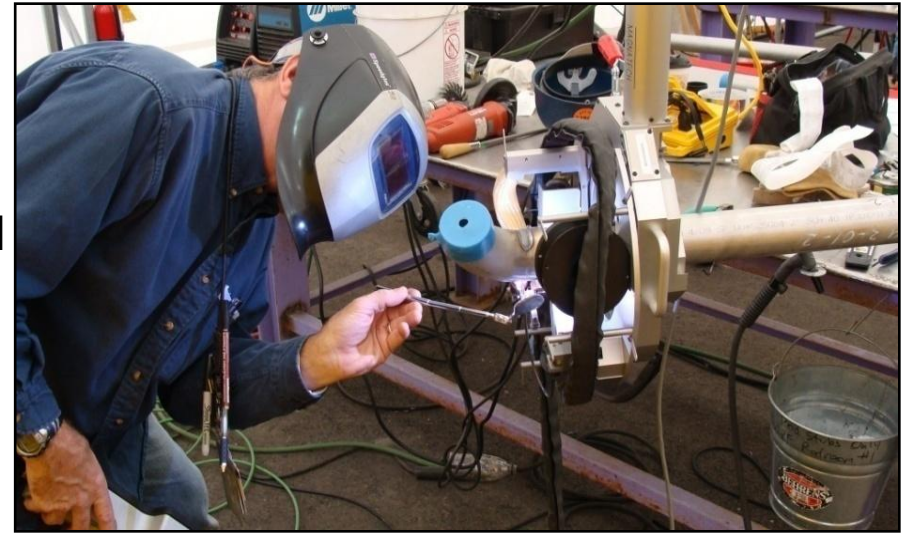
Alpha Strike Tanks and Salt Solution Feed Tank



Filter Feed Tank

SWPF: Proven Technology and Performance

- **Proven Technology:** Cross Flow Filtration with Caustic Side Solvent Extraction for removal of high level radionuclides from salt solution waste
- **Quality:** NQA-1
- **Schedule:** Start radioactive operations December 2014 – October 2015 (80% confidence)
- **Cost:** DOE approved total project cost - Performance Baseline is \$1.339 billion
- **Capacity Increases:** DOE has authorized improved process chemistry testing



Setting the Right Standards in Welding Performance
Onsite and at Supplier Facilities

SWPF Project/Construction Management

- **Supplier Oversight Plans in Place**
 - Full-time Parsons oversight in supplier facilities for SWPF critical components ensures safety and quality standards are met
- **Active Construction and Engineering Team**
 - Engineering proactively working real-time in support of constructability reviews
 - Engineered equipment fabrication to meet construction's needs
- **Early Operations Involvement**
 - Full-time involvement from start of design and participation in constructability, maintenance, operations, and commissioning reviews
- **Pipe Welding**
 - Onsite pipe & hanger fabrication and field installation in full operation
- **HVAC, Instrument Tubing, and Electrical Raceway Work in Progress**

SWPF – Onsite Fabrication of Pipe Spools and Field Piping Installation



Pipe Spool Fabrication



Alpha Strike Processing Corridor

CFF/CSSX Full Scale Next Generation Solvent (NGS) Test Operation

- NGS improves cesium extraction resulting in higher waste throughput to shorten lifecycle time for tank waste removal
- Test system preparations and checkout complete – testing in progress



Cross Flow Filter



Solvent Test System

Modified Monosodium Titanate (MST) Air Pulse Agitator (APA) Mixing Test Operation

- Improved extraction allows reduced titanium – more waste per canister
- Large scale testing underway to verify mixing characteristics



APA Mix Test



APA Test Tank

Parsons Delivering Results at SRS

2012-2013 SWPF Goals

- Construct facility walls, decking, roof, and support areas
- Install engineered equipment
- Install field piping and hanger fabrication
- Install HVAC and instrument tubing
- Install electrical and control system
- Prepare for startup, which advances SRS EM cleanup and risk reduction goals

